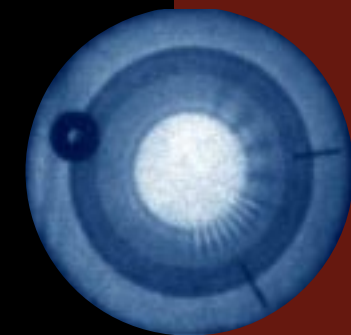


Introduction



The future Atlas Facility will provide 23-MJ of pulsed-power for science-based stockpile stewardship and basic scientific research. The Atlas capacitor bank, shown here, will be housed in 12 oil tanks arranged around a central target chamber. Each tank will contain up to two removable maintenance units and up to 32 capacitors. The entire structure will be 14 feet high and 80 feet in diameter. Atlas is expected to generate its first pulse in 2001. The image below shows a radiograph from a liner experiment at the Pegasus facility exploring material that spalls, or breaks free, from the target surface during the implosion. Data from such experiments allow us to test computational models. Atlas will allow us to conduct such experiments at much higher energy densities over a larger material volume.





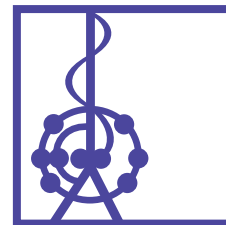
Physics Division personnel have achieved significant progress in research and development during the past two years. This progress report recounts the work of the Division during this creative and productive period as we supported Laboratory missions and goals in the areas of both basic and applied science.

The mission of the Physics Division is to further our understanding of the physical world, to generate new technology in experimental physics, and to establish a physics foundation for current and future Los Alamos programs. The work described and the publications cited in this report demonstrate the degree to which we have been able to implement this mission. The five main areas of experimental research and development in which Physics Division serves the needs of Los Alamos National Laboratory and the nation are (1) biological physics, (2) hydrodynamic physics, (3) neutron science and technology, (4) basic and applied plasma physics, and (5) subatomic physics.

This report includes Division goals, organizational structure and group summaries, selected research highlight articles, project descriptions, staffing and funding levels for FY97–FY98, and a list of publications and presentations by Physics Division authors. The research capabilities reflected here are based on the very broad array of talents and interests of the more than 300 physicists, engineers, and technicians who contribute to this enterprise. From our senior scientists and technicians to our experienced support staff, to our newest staff, postdocs, and students, this corps of talented individuals is our most important resource. Our staff's dedication to excellence, creativity and ingenuity, and relentless pursuit of scientific understanding are the fundamental drivers of our Division's success.

Additionally, we are empowered with a critical set of facilities that we operate and/or use. The latter include the proton and neutron capabilities of the Los Alamos Neutron Science Center (LANSCE) accelerator facility, the Pegasus II and Atlas pulsed-power facilities, the Trident laser complex, and several large plasma-generation devices. We also perform extensive experimental work at off-site facilities, including the underground containment facilities in Nevada, large beamline and detector facilities at the Fermi National Accelerator Laboratory (Fermilab) and Brookhaven National Laboratory, and gamma-ray and x-ray beamlines also at Brookhaven. Our work is not confined to domestic facilities. We are involved with experiments in Russia and states of the former Soviet Union, at the European Laboratory for Nuclear and Particle Physics (CERN) in Switzerland, at the Atomic Weapons Establishment (AWE) in the United Kingdom, with the Japan Atomic Energy Research Institute (JEARI), and with a host of other foreign collaborations. Finally, new projects are continuously being created in the Division. For example, we are evaluating the research impacts of an improved laser facility and a proton-radiography facility. We are dedicated to accomplishing all of this in a manner that protects the health and safety of our employees, the public, and the environment.

In addition to the wealth of productive collaborations with university and other government laboratories, industrial partnerships continue to be important to Physics Division. Over the past decade, we have established an extensive national network through cooperative and contract research, user facility agreements, scientific staff exchanges, and licensing. In the area of plasma science and particle beams alone, Physics Division performed meaningful work with over 50 companies, ranging from small start-ups in northern New Mexico to Fortune 500 corporations. Locally, we created an environment that enabled the creation of two new small businesses and attracted three industrial staff members for long-term residence at our facilities. In the past two years, our collaborative efforts have earned three prestigious R&D 100 Awards. In addition to their scientific content and economic impact, our industrial collaborations create a valuable network in which we can discuss human resource and operational issues such as environment, health, safety, security, finance, and intellectual property management.



Physics Division has also been a responsible neighbor to the Northern New Mexico community. In addition to the regional economic development that results from industrial partnerships, we initiated a well-received educational outreach program in 1998. Through this program, members of our technical staff visit Santa Fe high schools to present lectures and demonstrations. This allows us to transmit some of our enthusiasm for our recent research to the next generation of scientists and citizens. Through such outreach, we are able to tie our work to the subjects students study in their classes, conveying the greater implications of scientific study, as well as the imagination and excitement behind our work.

As you browse through this report, I hope that you will gain an understanding of who we are and what we do and that you will share my enthusiasm for the research it contains. If I can provide assistance or answer questions, please contact me.

A handwritten signature in blue ink that reads "Peter D. Barnes". The signature is fluid and cursive, with the first name "Peter" being more prominent than the last name "Barnes".

Peter D. Barnes, Director
Physics Division

Mission and Goals

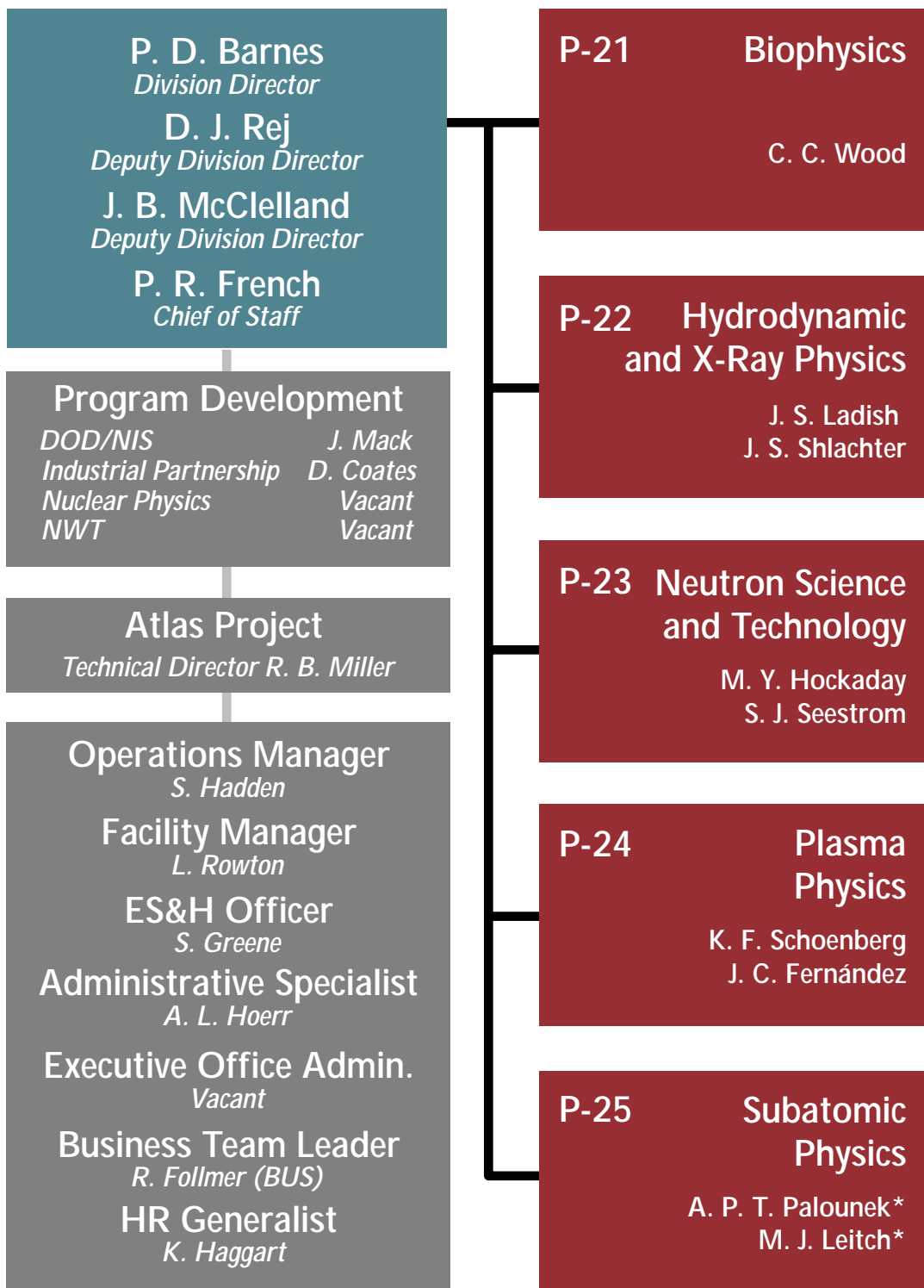
The mission of Physics Division is to further our understanding of the physical world, to generate new technology in experimental physics, and to establish a physics foundation for current and future Los Alamos programs.

The goals of Physics Division are to

- provide the fundamental physics understanding supporting Laboratory programs;
- investigate the basic properties of nuclear interactions, high-energy-density and hydrodynamic systems, and biological systems with a view toward identifying technologies applicable to new Laboratory directions;
- identify and pursue new areas of physics research, especially those to which the unique capabilities of the Laboratory may be applied;
- explore interdisciplinary areas of scientific endeavor to which physical principles and the methods of experimental physics can make an important contribution; and
- maintain strength in those disciplines that support the Laboratory mission.

Physics Division pursues its goals by

- establishing and maintaining a scientific environment that promotes creativity, innovation, and technical excellence;
- undertaking research at the forefront of physics with emphasis on long-term goals, high risks, and multidisciplinary approaches;
- fostering dialogue within the Division and the scientific community to realize the synergistic benefits of our diverse research interests;
- encouraging the professional development of each member within the Division; and
- conducting all of its activities in a manner that maintains a safe and healthful workplace and protects the public and the natural environment.



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